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ABSTRACT

The effect of interview length on wave nonresponse in a longitudinal survey was studied, controlling for respondent-specific characteristics known to affect survey response. Data from the National Longitudinal Survey of Youth were used, for a sample of over 10,000 people who were 14 to 22 years old when first interviewed in 1979. These individuals have been interviewed annually every year since, yielding 16 years of data. Over the years, the length of the interview has varied. A transition probability model is estimated using hazard equations. With personal, demographic, and environmental factors known to influence survey response and several measures of respondent attitude and cooperation held constant, longer interview length was associated with sample retention. With the hypothesis that interview length may proxy for some uncontrolled dimension of respondent cooperation, an alternative measure to interview length, the number of questions asked, was constructed. Reestimating the hazards with this variable generates similar findings. It is conjectured that survey length, whether measured in minutes or in the number of questions asked, measures the salience or applicability of the survey to the respondent. Those with characteristics most important to the content of the survey have the longest interviews and are also the most interested. It is proposed that survey instruments be designed with questions applicable to all respondents, focusing less on the average length of the interview and more on the range of potential interview lengths. An appendix presents variable definitions and tables of nonresponse estimation hazard by subgroups. (Contains five tables, seven figures, five appendix tables, and eight references.) (SLD)

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Discussion Paper

The Effect of Interview Length on Attrition in the National Longitudinal Survey of Youth

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March 1995

Report: NLS 95-28

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THE EFFECT OF INTERVIEW LENGTH ON NONRESPONSE IN THE NATIONAL LONGITUDINAL SURVEY OF YOUTH

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ABSTRACT

In this paper, we examine the effect of interview length on wave nonresponse in a longitudinal survey, controlling for respondent-specific characteristics known to affect survey response. We use the National Longitudinal Survey of Youth (NLSY), a sample of over 10,000 individuals who were 14-22 years old when first interviewed in 1979. These individuals have been interviewed annually every year since then, providing 16 years of data. The interviews have been conducted in person in all years except one. Unlike the CPS or SIPP, the NLSY does not allow proxy responses. The NLSY attempts to interview virtually all living respondents each year. Over the years, the length of the interview has varied. It also varies substantially across individuals in the sample within years.

A transition probability model is estimated using hazard equations. Holding constant personal, demographic, and environmental factors known to influence survey response as well as several measures of respondent attitude and cooperation, we find that longer interview length is associated with sample retention. Hypothesizing that interview length may proxy for some uncontrolled dimension of respondent cooperation, an alternative measure to interview length, namely the number of questions asked, was constructed. Reestimating the hazards with this variable generates similar findings.

We conjecture that survey length, whether measured in minutes or number of questions asked, measures the saliency or applicability of the survey to the respondent. Those respondents who possess the characteristics most important to the content of the survey have the longest interviews but are also the most interested. The policy prescription we propose is to design survey instruments which include sets of questions applicable to all respondents, focusing less on the average length of the interview and more on the range of potential interview lengths.

KEYWORDS

Attrition, Interview Length, National Longitudinal Survey of Youth, NLSY, Nonresponse

Introduction

A common belief exists that nonresponse increases with the length of the survey. In this paper we use a panel data set, the National Longitudinal Survey of Youth (NLSY), to estimate the effects of survey length on attrition. By using panel data, where the same individuals are interviewed repeatedly, we are able to control better for person-specific factors than is possible in a cross-section survey. Repeated observations of the same people with measures of interview length which vary across people and across time provide a rich framework for isolating the impact of survey length.

We control for a variety of demographic, personal, and environmental characteristics, many of which have been found in the literature to be correlated with nonresponse in surveys. (See Groves (1989) and Groves, Cialdini, and Couper (1992) for discussions of the causes of nonresponse and findings from various surveys. Gritz, MaCurdy, and Mroz (1994) study attrition in the NLSY. They characterize nonrespondents and returnees and examine the effects of attrition on the longitudinal representativeness of the panel.) We also make use of some interviewer assessments regarding the respondent's cooperativeness and understanding of the survey and other person-specific indicators of cooperativeness such as the number of contacts required before an interview was completed and whether the individual had to be converted. In general we find that longer surveys do not increase attrition and, in fact, may indicate a cooperative, interested respondent.

The National Longitudinal Survey of Youth (NLSY)

The NLSY, sponsored by the Bureau of Labor Statistics, is a sample of young people who have been interviewed annually since 1979.[1] Originally 12,686 youths between the ages of 14 and 22 were interviewed. The sample included oversamples of blacks, Hispanics, economically disadvantaged nonblack nonHispanics, and youth in the military. The military sample was discontinued after 1984 and the economically disadvantaged nonblack nonHispanic oversample was discontinued after 1990. The baseline sample, adjusted for these deletions, includes 9,763 individuals. Interviews have been fielded as face-to-face in all years except 1987 when the survey was fielded by telephone. In any year, some interviews may have been conducted by telephone ranging between about 5 and 15 percent of completions. Proxy interviews are not allowed in the NLSY and respondents are offered $10 for their time (though some receive more than $10).

The focus of the NLSY is primarily on labor market behavior. Information is collected about all jobs held since the last interview including starting and ending dates, occupation, industry, wage and hours worked. In addition to information about jobs, the survey collects items related to labor market behavior such as education and job training, household composition, marital history, fertility, health, income, assets, and program participation.

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[1] For a more complete description of the NLSY, see the NLS Handbook (1994).

In various years other federal agencies have contributed funding to increase the content of the survey. In particular, questions have appeared regarding the respondents' drug use, alcohol use, sexual activities, child care, and pregnancies. Beginning in 1986 and every other year since, questions have been addressed to the mothers in the sample regarding the physical, cognitive, and emotional development of their children. The children were administered several assessments appropriate for their age.

Attrition in the NLSY is low by comparison with other longitudinal surveys. Data collection is undertaken for ELS by NORC, which has done an incredible job of maintaining high response rates. After 16 years of interviews, nearly 90 percent of the "adjusted" baseline sample cooperated in 1994. In this paper, we used data through 1992 and adjust the baseline for the deleted samples. In 1992, the overall response rate was 90.5 percent of the baseline sample.

One difference between the NLSY and other surveys is that contact is attempted with virtually all living respondents. This includes respondents who have moved overseas, those who have entered the military, those who have entered prison, etc. Many longitudinal surveys drop an individual from the eligible interviewing sample after one or two nonresponses. Most surveys do not interview anyone who leaves the United States, leaves the civilian population, or enters an institution. The high response rates maintained in the NLSY reduces the need for complicated weighting schemes or heroic assumptions about nonresponse.

Attrition in the NLSY is not true attrition in that respondents can return to the sample. Therefore it is more accurate to refer to nonresponse (by this we mean wave nonresponse, as opposed to item nonresponse[2]). In any given year between 4 and 10 percent of the baseline sample was not interviewed. Table 1 shows the response rate in each year of the survey. The first column labeled "Total" shows the rate for the entire sample as a percentage of the baseline sample. The second column labeled "Total" shows the "continuous" response rate, i.e. the percentage of the baseline sample who had been interviewed in all survey years. As can be seen, 74.5 percent have been continuously interviewed. This is more consistent with retention rates in other surveys, though it is still generally higher for comparable numbers of years or interviews. Excluding 1980, the percentage of first time nonrespondents has ranged between 1.2 in 1991 to 2.7 in 1987.

Similar to other surveys, response rates have differed by sex and race/ethnicity. Table 1 also shows the yearly and continuous rates for males and females. On an annual basis, females appear to have only a slightly higher response rate than males; the difference generally being between 1 and 3 percentage points. However, the percentage of males who have ever been nonrespondents has been significantly higher than females. The continuous response rate for females was 78.2 percent in 1992 while only 70.7 percent for males. In other words, 21.8 percent of all females had at some time not responded, while 29.3 percent of males had at some time not responded.

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[2] We do not address potential response deterioration caused by the length of the survey. For a study which examines response quality and survey length see Herzog and Bachman (1981).

Table 2 shows yearly and continuous response rates for Hispanics, blacks, and others. Response rates by year do not differ greatly by race or ethnicity, though Hispanics are slightly lower in most years. On the other hand, continuous response rates for Hispanics definitely lag the other two groups. Blacks have generally kept pace with nonblack nonHispanics (other); only starting in 1987 does there appear to be the beginning of a widening gap in continuous response rates.

Interview Length in the NLSY

The NLSY questionnaire is a fairly complex instrument with significant skip patterns which generate very different lengths of interviews across respondents. A major section on jobs does not apply to those who are not employed; major parts of the fertility and child care sections do not apply to people without children; etc.. Interview length has also varied over time, particularly due to the irregular inclusion of questions from other federal agencies.

Table 3 shows the average interview length for each year of the survey.[3] As can be seen, the average length of interviews has varied from a low of 32.5 minutes in 1987 to a high of 86.3 minutes in 1979, with a wide range of times in between.

Table 3 also shows the 10th and 90th percentiles for each year. These percentiles demonstrate the wide variance in survey length across respondents. The lengths at each of these extreme percentiles move in the same manner over the years as the averages. The difference between the 10th and 90th percentiles is fairly stable, but shows some variance consistent with the movements of the average. The movements in the 10th and 90th percentiles relative to the averages can be seen in Figure 1.

Correlates of Nonresponse

To estimate the effects of interview length on nonresponse, we estimated transition probability models (TPM). Because respondents can return to the sample, we focused on first time nonresponse. The transition probability model is the same one used in Gritz and MaCurdy (1992). A full description of the model can be found in that paper.

The TPM derives a hazard function. The hazard function measures the probability of leaving the sample in a given year, conditional on having been interviewed each previous year. (This is the inverse of the survivor function which measures the probability of remaining in the sample conditional upon having been interviewed in each previous year.) The hazard is a spell-based model. The dependent variable takes a value of zero for all years in which the individual responded until a year of nonresponse occurs; then it takes a

[3] This measure does not include an initial household enumeration and a section at the end of the interview used to collect locating information which, on average, take about five minutes each.

value of one in the first year of nonresponse. After that year, the individual does not contribute to the model since we look at first time nonresponse only.

We held constant a large set of variables including a variety of demographic and other personal characteristics of the respondents, environmental variables, and interview characteristics. These covariates were allowed to change over time to reflect the status of the respondent in each interview year. Holding these variables constant, the effect of interview length was isolated. The hazards were estimated using sampling weights to reflect the fact that minorities are sampled at higher rates.

The complete set of parameter estimates with variable definitions appears in the Appendix tables. Because the parameter values do not have an easy interpretation, we confine ourselves here to a discussion of the direction of the effects (and statistical significance). Eventually one would want to determine the size of the effect, but at this point we only discuss the correlates. The relationship of each set of variables to attrition is described below.

Demographic, Personal, and Environmental Characteristics

Race/ethnicity

The sampling scheme for the NLSY categorizes individuals into three groups: blacks, Hispanics, and others. Unlike Census definitions, blacks and Hispanics are mutually exclusive. The hazards reveal no difference between the nonresponse probabilities of blacks and others for men or women. However, Hispanics have a greater likelihood of nonresponse. This bears out the uncontrolled patterns shown earlier. Relative to others, both blacks and Hispanic nonresponse is more likely to be due to locatability as opposed to refusal.

Age

Individuals in the sample were born between the years 1957 and 1964. The empirical results show that, in general, nonresponse increases with age. It is not clear whether this is because the younger a person begins as a respondent the more likely that person becomes "hooked" or if the younger respondents merely haven't gotten to the ages where they are more likely to become nonrespondents.

Marriage and Fertility

Being married increases the likelihood of nonresponse for both sexes, and particularly for women. The explanation may reside in the alternative uses of time for married people, or because spouses exert an uncooperative influence. These findings, however, are not

consistent with findings in the literature. Groves and Couper (1993) study seven surveys and find that the surveys they examine mostly indicate single people as less likely to participate. It is not obvious why our results would differ.

Related to this may be a measure of whether the respondent's parents are in the household. Parents were generally in the household for the younger respondents in the early years of the survey. Some youth may remain in their parents' household or return to it. This may be particularly true for women. For men, there was no impact of the parents being in the household; for women, it increased the likelihood of nonresponse. On the other hand, the presence of others during the actual interview had no effect on future attrition.

The impact of having children entered into the equation in two separate variables. One was a dummy variable indicating the presence of one's own children in the household. The other variable was a continuous measure of the actual number of one's own children in the household. The effects are different for men and women.

For men, there is no difference in average response for those who had children versus those who do not. However, for those who had children, the more children they had, the less likely they were to leave the sample.[4] For women, the very presence of children had a significant effect in retaining the woman in the survey. In addition, the more children she had, the more likely she stayed with the survey. Groves and Couper (1993) find a positive effect of children on survey participation in the surveys they studied.

Education

Two measures were included which captured schooling. One variable measured the effect of being enrolled. For both men and women, being enrolled increased the likelihood of staying in the survey.

The other measures were a set of educational attainment variables. These include variables for high school dropouts, high school graduates, those with some college, and college graduates. Here there was no pattern for women. For men, however, retention in the sample increased consistently with the level of educational attainment.

Employment and Workforce Attachment

The primary focus of the NLSY is labor force behavior. A considerable amount of information is collected about each job, each training program, and each nonwork spell. The saliency of the survey may be related to an individual's employment status. Of course, the burden encountered by the respondent is also related to their employment status. Measures of workforce attachment may also account for the general stability of the

[4] The variable was defined as having one's own children in the household. In this model, a divorced father whose children are living with their mother would be the same as a man with no children.

individual. Three variables were used in this context: employment status at the time of the interview, average weeks worked per year, and average number of jobs per year.

Employment at the time of the survey had no effect on women. For men, it increased the likelihood of staying with the survey. Average weeks worked per year measured the degree of long-term attachment to the labor market. For both men and women, more weeks worked implied lower likelihood of nonresponse. Average number of jobs per year is a measure of general job stability. For men, the more jobs per year, the greater the probability of nonresponse. There was no effect for women.

Earnings

Other studies have shown that nonrespondents tend to come from certain portions of the earnings distribution; typically both the lower and upper tails.[5] Here we found that having no earnings predicts future nonresponse. Moving up in the earnings distribution does not yield a clear pattern for either men or women. Most other studies have found nonresponse correlated with other measures of socioeconomic status (particularly at the low end). Consistent with these studies, we find an impact of earnings at the very low end. The lack of a clear pattern may be attributable to our many measures which already reflect socioeconomic status and that earnings has no clear independent effect.

Region and Urbanicity

Nonresponse does not differ for women across regions. However, there were considerable differences for men. Men in the northeast had the lowest propensity to respond; those in the north central region had the highest. The west and south were similar to each other, lying between the other two.

Urbanicity was measured with a set of variables representing rural areas; urban areas which are not part of a SMSA; areas that are part of a SMSA but not a central city; areas that are part of an SMSA, but only partly in a central city;[6] and areas that are the central city of a SMSA. The only distinction which mattered in the estimation was living in a central city. For both men and women, living in a central city implied greater likelihood of attrition. This is consistent with other studies of nonresponse. Groves and Couper (1993) try to account for this finding by including variables which vary by urbanicity. After including these variables, they still find a direct effect on participation of living in a central city.

[5] Gritz, MaCurdy, and Mroz (1994) find this for the NLSY.

[6] These are zip codes which span across central city and noncentral city.

Measures of Respondent Attitude

A variety of measures exist to inform us about the respondent's attitude toward the survey. The most obvious is an interviewer assessment made at the end of the interview. The interviewer chose from among four categories: friendly and interested; cooperative but not particularly interested; impatient and restless; and hostile. Most individuals fall in the first two categories, about three-quarters are in the friendly and interested category, one-fifth in the cooperative category. Only approximately 3-4 percent in each year are coded as impatient and restless, and generally less than one-half of one percent are coded as hostile. (See Table 4 for the percentages in each category in each year.) Despite the low numbers of those in the two more hostile categories, these variables are very strong predictors of nonresponse. In the estimation, the probability of attrition increased successively moving from the most cooperative to the most hostile categories.

Another direct measure of cooperation is whether the respondent had to be converted. The designation of whether a case was converted rested with the interviewer and is not always consistent. It can take a variety of forms from a simple refusal that requires a second attempt to cases when a special interviewer with conversion expertise and great persuasive powers is brought in after the initially assigned interviewer has failed to secure a response. Not surprisingly the percent of the sample who had to be converted has grown over time. Table 5 shows the percent converted each year. In the earliest years (1979-1983), this was under 3 percent. Conversions grew somewhat after 1983, then took a big jump after 1988.[7] The big jump may be attributable to changes in procedures for coding conversions. Given the number of years, the percentage requiring conversion remains low.

The hazard estimation shows that as was the case for the interviewer's assessment of the respondent's attitude, if a respondent was converted, it is a strong indicator of future nonresponse.

A less direct measure of cooperation is the number of contacts which were attempted before an interview was secured. Interviewers are required to record any time they attempted to contact the respondent. This includes busy signals and no answer on the phone or at the door, which introduces noise into this as a measure of cooperation. If it is purely noise, there should be no predictive power for attrition. We hypothesize that it does correlate with cooperativeness of the respondent. Table 5 also shows the mean number of contacts attempted for those who were interviewed by year. The average grew for the first several years, but has leveled off since the mid-1980s.[8]

We allowed the impact of the number of contacts to vary in a noncontinuous manner. Ranges of the distribution were constrained to have the same impact, but different ranges could have different impacts. This method was chosen over the more conventional method of a linear relationship which requires the marginal effect of the variable to be the

[7] The spike in 1987 can be attributed to fielding the survey as a centralized telephone operation.
[8] The spike in 1987 can again be attributed to fielding the survey with a centralized telephone design.

same at all points. Although the relationship is not everywhere consistent, the hazards indicate that there is predictive power. The greater number of contacts required, the more likely that the person will be a future nonrespondent.

Another less direct measure of cooperation is whether the interview was conducted in person as designed or on the telephone. Each year since the beginning, some people would only consent to a telephone interview. To achieve desired response rates, interviewers offer a telephone interview in lieu of a personal interview. There are significant restrictions on this practice to maintain the integrity of the design. Over the years there has been growth in the percentage of interviews completed over the telephone (see Table 5).

We hypothesize that completing an interview by telephone is a measure of noncooperation, perhaps a step along the way to nonresponse. In fact, the hazards bear this out. For both men and women, those who completed their interview on the telephone were more likely not to participate in future interviews.

One issue which affects cooperation is the presence of sensitive questions. The NLSY has had a variety of sensitive questions in various years including questions on alcohol, drugs, sexual activity, criminal activities, and (not least of all) income. In general, item refusal rates for any of these variables has been low. Even as the sample has aged, the item nonresponse rates have not grown appreciably. However, we attempted to capture whether these questions may be problems for certain people.

We chose two variables to examine.[9] The first was whether the person refused to answer a question about lifetime marijuana usage. This question, in slightly different form, appeared in 1980, 1984, and 1988 as the lead-in to a set of questions about drug usage.[10] A dummy variable indicated whether the person refused to answer the question. For both sexes, refusing to answer indicated increased likelihood of nonresponse, though it was not significant for men.[11]

The second variable was earnings. Many people argue that income variables are more sensitive than questions about sex and drugs. We counted a refusal if the respondent refused to answer any of three earnings questions: wage and salary earnings, military earnings, or earnings from one's own business or farm. Each question referred to the previous calendar year. The estimation indicated that for both men and women, refusing to answer earnings questions was indicative of future nonresponse.

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[9] Our choices were determined by two considerations. There had to be a significant number of refusals (questions about alcohol usage, for example, had almost no refusals) and the questions had to apply to the entire sample.

[10] Drug questions also appeared in 1992 and 1994, but these years were not part of our analysis.

[11] We also accounted for the mere presence of drug questions. There was no effect for men, but for women their presence was associated being more likely to stay with the survey! This may be spurious, accounting for some other year-specific aspect of the survey.

We also tried a variant on the earnings variable. Some people answered "don't know" to earnings questions. While this may be a truthful response, we hypothesized that it may also reflect an unwillingness to answer the question while not wanting to say so directly. Counting refusals *and* "don't knows" together, we tested if they had separate predictive power in the attrition hazard. For women, they did not, indicating that women are not choosing the don't know response in lieu of refusing. Men, on the other hand, showed an additional effect from "don't knows." Such an answer is a further predictor of nonresponse beyond the effect of refusing indicating that men are less willing than women to provide direct answers.

Survey length

The impact of survey length on attrition is modeled in a fairly unstructured way in order to let the effect vary over the distribution of times. We also allow differential effects from the most recent interview and the average of all previous interviews. Each of these effects are allowed to differ in the early, middle and later years. This unstructured approach does not require us to have prior expectations on the relationships as would, say, a simple linear or quadratic specification.

The results are quite surprising. While it is difficult to make generalizations because of the number of parameters which are allowed to vary, the length (in minutes) of the most recent interview has either no impact on attrition, or, reduces the likelihood of attrition. To be more specific, for both men and women, the longer the most recent interview in the early years (modeled as years 1-5), the more likely the person stays in the sample. The length of the most recent interview has no effect in the middle and later years. Though our result is surprising, it is consistent with the findings of Zabel (1994). He examined the Panel Study of Income Dynamics (PSID) and two waves of the Survey of Program Participation (SIPP). Using a hazard model, but with different specifications than ours, Zabel found that response increased with survey length in both surveys. The subject matter of the NLSY is similar to these two surveys, though there are some important design differences.

The length of the most recent interview may not be the best indicator of how survey length impacts on respondents' cooperation. Hazard estimation allows us to condition response on historical information from previous waves of the survey. To capture the impact of interview length beyond the most recent interview, we also measure the impact of the average length of all previous interviews. With each successive interview, the average of all previous interviews changes.

To see best the impact of longer interviews, we calculated the predicted hazard rates for a base case of a 60 minute interview in all years. Then we made the same calculations assuming the length of the interview to be 90 minutes in all years. Figure 2 shows the predicted hazard rates for men assuming a 90-minute interview compared with the base

case-60 minute interviews. In this case, increasing the length of the interviews does increase the hazard rates in the early years. By the sixth year the effect goes away.

We performed the same type of experiment but decreased the length of all interviews to 30 minutes. The predicted hazard rates for this length interviews also appears in Figure 2. The surprising finding is that decreasing the interview length also increases the hazard rates, in fact by more than increasing the length of the interview. The effect also goes away after about six years.

The predicted hazard rates for women for the same two experiments are seen in Figure 3. The results are more striking. Increasing the length of all interviews from 60 to 90 minutes has no impact in the first four years. After that, the hazard rates are lower in all years. Shortening the interview from 60 to 30 minutes has no impact in the first four years either. After that, the hazard rate increases by a small amount for several years, returning to having no impact in the later years.

To recapitulate, we see that lengthening the interview may increase nonresponse for men in the early years. However, shortening the interview also increases nonresponse, and by more. Lengthening the interview for women reduces nonresponse; shortening it increases nonresponse.

One hypothesis is that interview length is another measure of cooperation. Those who enjoy the interview or take it seriously spend more time talking with the interviewer, more time considering their answers, and generally create a more relaxed and slower-paced interview. However the effect has to be independent of the other measures we have included to capture cooperation as they have been held constant.

As an alternative to interview length we attempted to create a variable which measures the number of questions asked of a respondent. Some questions collect information which is not released and could not be counted by using the public data set. Other questions were difficult to count directly such as when prerecorded items are verified. However, we believe the amount of noise in this measure is considerably less than in the measure of interview length. Figure 4 shows the average number of questions and the 10th and 90th percentiles by year. The pattern is very similar to the pattern for interview length by year. Figure 5 shows the averages for the two variables overlaid with an arbitrary adjustment in the scales. It can be seen that the two measures move very closely together over time.

We reestimated the hazards, replacing interview length with the number of questions asked. We entered the number of questions as a series of variables symmetrical with our treatment of interview length. The results are equally provocative. To see the impact of the number of questions we performed experiments similar to those for interview length. We established predicted hazard rates for a base case of 250 questions asked. Then we predicted hazard rates for interviews with 325 questions asked and for interviews with 175 questions asked. Figure 6 show the results for men; Figure 7 for women.

More questions unambiguously decreased the hazard rate for men in all years. For women, the hazard rate is lower through the tenth year, after which the effect disappears. Fewer questions lowered the hazard rates of both men and women in the early years. For women, the effect goes away beginning around the sixth year. For men, reducing the number of questions increases hazard rates in the sixth and subsequent years with a sharp increase in the middle years.

In general, the effect of the number of questions asked is similar to the effect of interview length. Longer interviews, as measured either in minutes or in questions asked can lead to an increase in predicted response rates.

Discussion

After controlling for a variety of demographic, personal, and environmental characteristics, we investigated the impact of survey length on nonresponse in the National Longitudinal Survey of Youth, a panel data set, using the first 14 of the 16 years of data on the same individuals. The effect of survey length on first nonresponse was found to be generally the opposite of what was expected; in only one case did the anticipated direction occur. Otherwise, interview length seems to either have no pattern of effect, or it leads to greater likelihood of retention. An alternative measure of burden, the number of questions asked had similar, but stronger, effects.

To the extent that interview length showed no effect, this result is important and perhaps only mildly surprising. It is possible that interview length may not have much of an effect in a face-to-face survey like the NLSY, but may have more impact with a telephone interview. To the extent that interview length actually indicated that longer interviews lead to less attrition, this result is quite surprising. Of course, nothing here implies causality, only correlation, and it does not seem credible to suggest that we should lengthen our interviews in order to retain respondents.

It may be that interview length is picking up some other respondent attribute. It is difficult to identify what this would be that is not already captured in the control variables, especially given our variety of measures of cooperation. However, cooperation may be a multidimensional attribute, only partially captured by our control variables.[12] Another possible explanation is saliency, or applicability. The more the survey applies to the individual, the more questions which will be asked and the longer the interview, accounting for the strong resemblance in their movements over time.[13] If the survey is applicable, the respondent may in fact be interested. The more applicable, the more interested the respondent is.

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[12] In fact, cooperation must be multidimensional for all of our various measures to independently have significance, as they do. Otherwise multicollinearity would lead to insignificance.

[13] On the other hand, a simple regression of survey length on the number of questions asked yields an R-squared of only about .2, implying only weak correlation at the micro level. We intend to explore this further.

The main focus of the survey is labor force behavior. We observed that those who were employed and those with greater labor market attachment and stability were more likely to stay with the survey. The second biggest focus of the survey, particularly for women, is fertility, with a substantial number of questions on each child and, for women, each pregnancy. We also observed that the number of children was positively associated with staying in the sample. This implies that we have already controlled for this sort of saliency. However, the number of possible controls is substantially larger than what we have used here. It is plausible that interview length is a proxy for saliency in some way not measured by our control variables. As noted, nearly all respondents are considered by interviewers to be cooperative, the vast majority friendly and interested. (Of course, we have controlled for this, too.) If respondents are willing to participate in a survey that lets them talk about their lives, they may be relatively insensitive to the length of the survey (at least within the bounds of the interview lengths in our data). But if the survey is generally inapplicable to them, they have little interest and become nonrespondents. This is reflected in the findings that decreasing the length of the interview or the number of questions asked also increases nonsresponse.

This implies that our surveys should contain series of questions which can apply to all types of people in order to maintain response rates. When we construct our surveys, we generally focus on the average length of the interview. Our findings imply that in addition to averages, we should also concentrate on variances.

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Table 1

NLSY Response Rates by Year, by Sex

Survey Year	Percent of Baseline			Percent Continuous		
	Total	Male	Female	Total	Male	Female
1979	100.0	100.0	100.0	100.0	100.0	100.0
1980	96.0	95.7	96.2	96.0	95.7	96.2
1981	96.6	96.4	96.7	94.3	93.8	94.8
1982	95.8	95.5	96.1	92.7	91.9	93.5
1983	96.4	96.0	96.8	91.7	90.8	92.5
1984	95.3	94.7	95.9	89.9	88.6	91.1
1985	94.0	93.2	94.8	87.7	86.0	89.3
1986	91.9	90.8	93.0	85.2	83.1	87.2
1987	90.4	88.8	91.9	82.5	79.9	85.1
1988	90.2	89.3	91.0	80.1	77.4	82.8
1989	91.3	90.0	92.7	78.8	75.7	81.8
1990	89.8	88.5	91.2	77.0	73.7	80.2
1991	90.5	89.0	92.0	75.8	72.1	79.4
1992	90.5	89.2	91.8	74.5	70.7	78.2

Table 2

NLSY Response Rates by Year, by Race/Ethnicity

Survey Year	Percent of Baseline				Percent Continuous			
	Total	Hispanic	Black	Other	Total	Hispanic	Black	Other
1979	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1980	96.0	94.7	96.3	96.3	96.0	94.7	96.3	96.3
1981	96.6	95.6	97.2	96.5	94.3	92.4	95.1	94.5
1982	95.8	94.1	96.2	96.3	92.7	89.7	93.6	93.4
1983	96.4	95.2	96.7	96.6	91.7	88.5	92.2	92.6
1984	95.3	94.9	96.2	95.0	89.9	86.7	90.8	90.5
1985	94.0	92.8	94.7	94.0	87.7	83.5	88.8	88.6
1986	91.9	89.9	93.0	92.0	85.2	80.5	86.6	86.2
1987	90.4	87.1	91.7	90.9	82.5	76.9	83.8	84.0
1988	90.2	86.6	91.5	90.7	80.1	73.8	81.3	81.9
1989	91.3	90.0	92.3	91.3	78.8	72.9	79.6	80.6
1990	89.8	88.2	90.5	90.1	77.0	71.0	77.6	79.0
1991	90.5	89.8	90.0	91.1	75.8	69.9	75.7	78.1
1992	90.5	90.3	89.9	90.9	74.5	68.9	74.2	76.9

Table 3

NLSY Interview Lengths by Year

Survey Year	Average	10th Percentile	90th Percentile
1979	86.3	55	125
1980	67.2	40	95
1981	63.6	40	90
1982	69.3	45	95
1983	59.0	35	85
1984	71.3	45	105
1985	58.3	35	85
1986	55.3	30	85
1987	32.5	19	50
1988	74.0	45	110
1989	47.2	30	70
1990	55.0	31	80
1991	37.7	22	55

Table 4

NLSY Respondent Attitudes Reported by Interviewers, by Year

Survey Year	Interested	Cooperative	Impatient	Hostile
1979	74.7	21.4	3.6	0.3
1980	76.3	20.6	2.9	0.3
1981	76.8	20.1	2.9	0.3
1982	76.7	19.6	3.4	0.3
1983	78.4	18.6	2.7	0.3
1984	77.4	18.9	3.2	0.5
1985	78.2	18.0	3.4	0.4
1986	75.8	20.5	3.3	0.4
1987	82.6	14.4	2.7	0.3
1988	73.4	22.1	4.1	0.4
1989	75.0	20.4	4.2	0.5
1990	74.4	21.7	3.6	0.3
1991	75.1	21.2	3.2	0.5

Table 5

NLSY Mean Contacts, Percentage of Telephone Interviews and Converted Interviews, by Year

Survey Year	Mean Number of Contacts	Phone Interviews	Converted Interviews
1979	3.14	4.3	1.2
1980	4.52	4.5	1.0
1981	5.26	5.2	1.4
1982	5.68	8.1	2.0
1983	5.74	2.3	2.4
1984	6.20	5.1	4.1
1985	6.50	8.4	5.4
1986	6.51	8.6	5.1
1987	8.70	89.0	13.6
1988	6.80	8.9	7.8
1989	6.43	14.1	16.6
1990	6.34	12.2	13.0
1991	6.60	13.7	17.7

Figure 1 NLSY Interview Length by Year

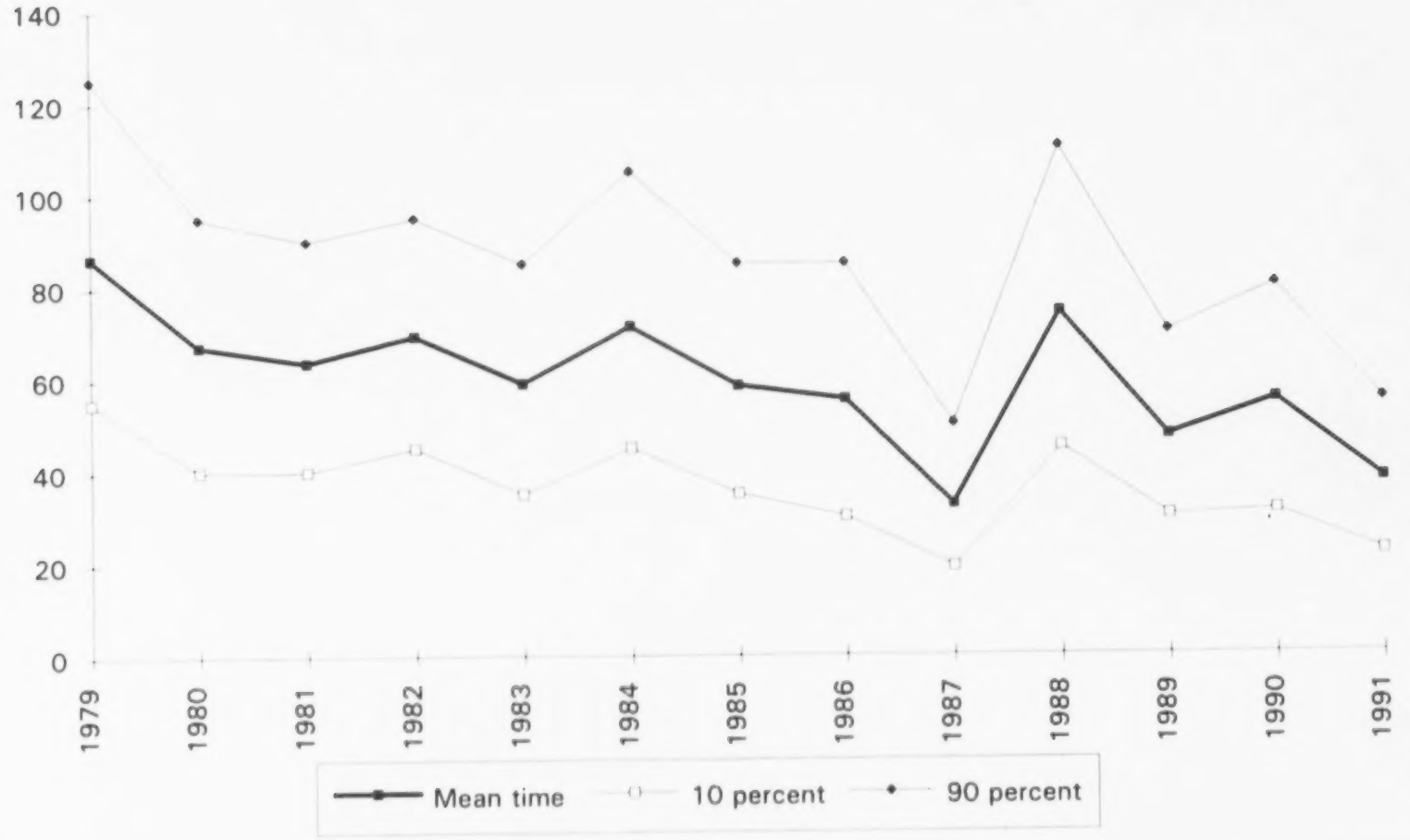


Figure 2

Predicted Hazard Rates for Men
Changing the Interview Length

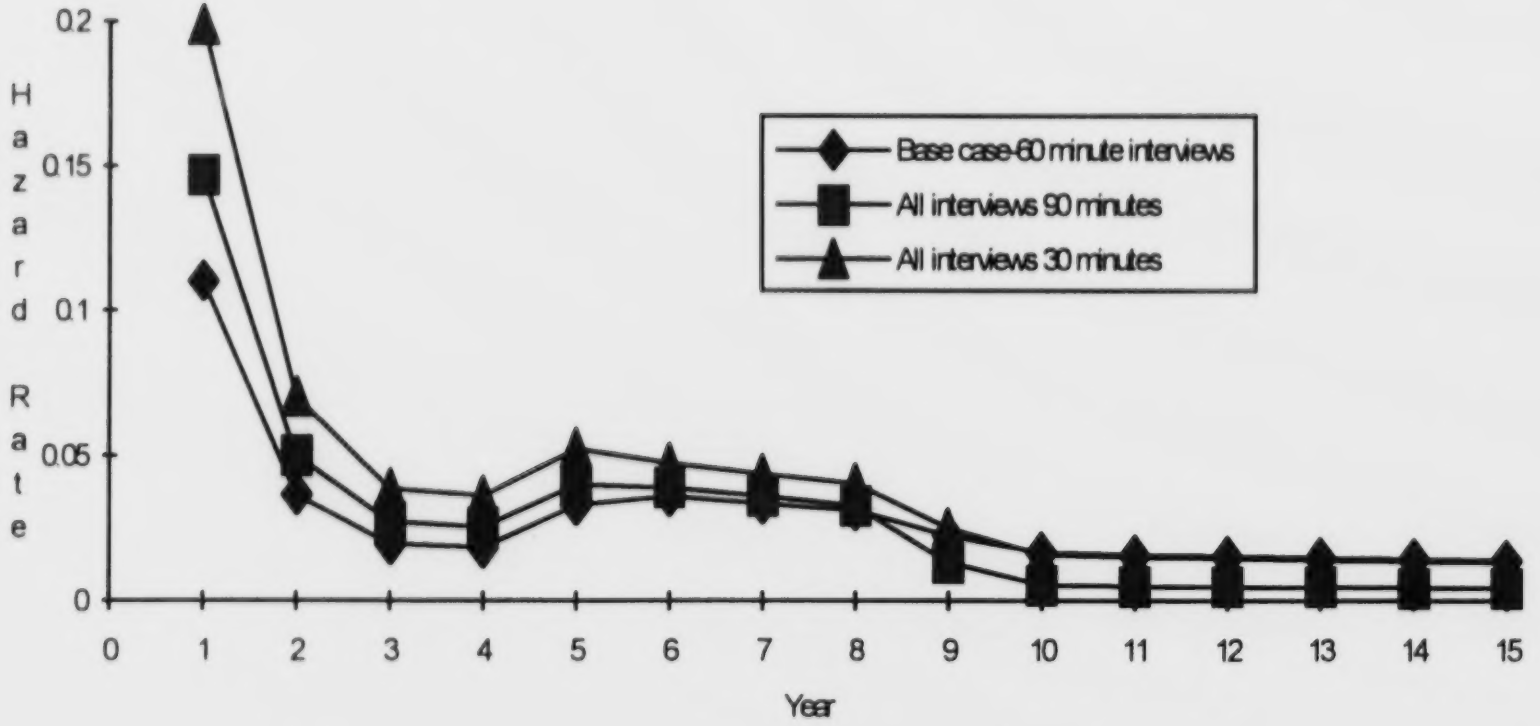


Figure 3

Predicted Hazard Rates for Women
Changing the Interview Length

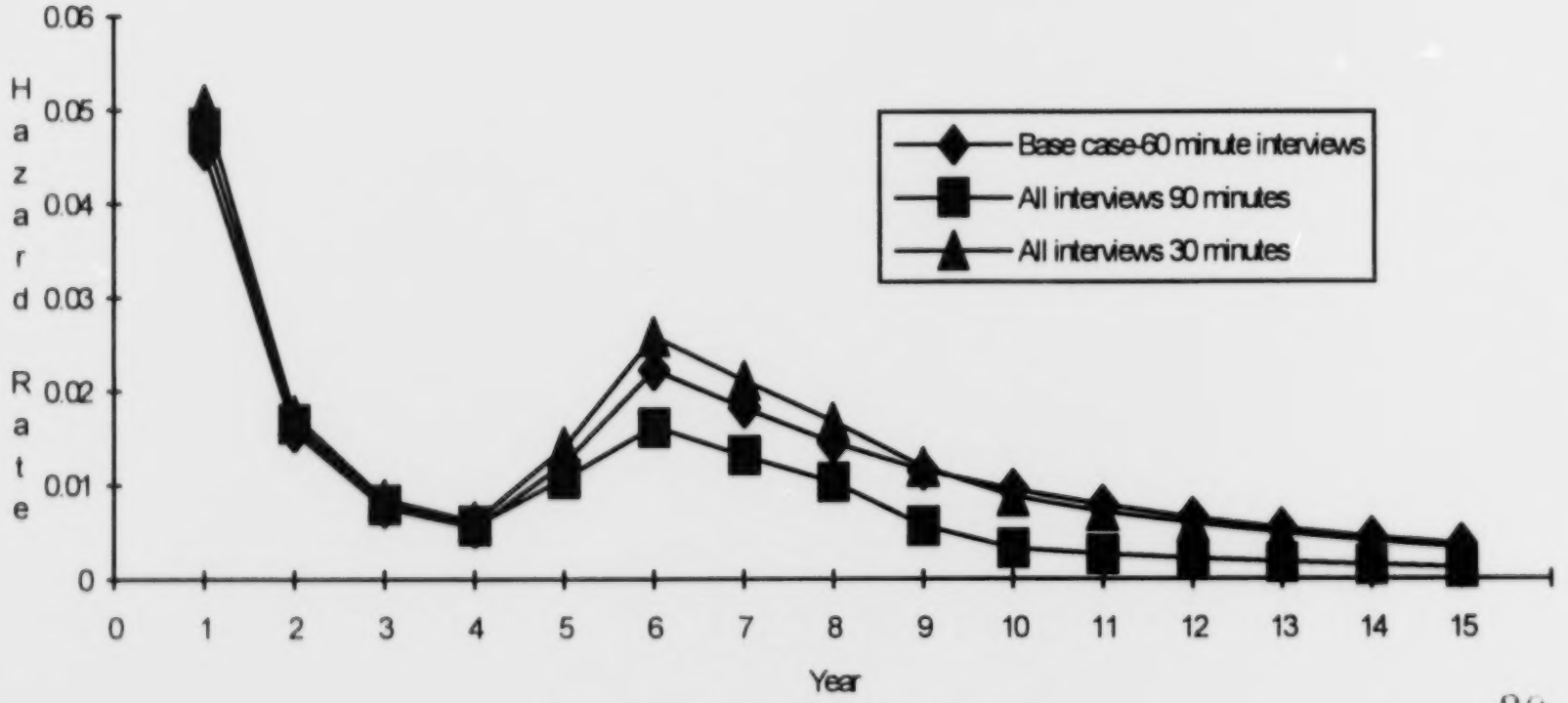


Figure 4 Number of NLSY Questions Asked by Year

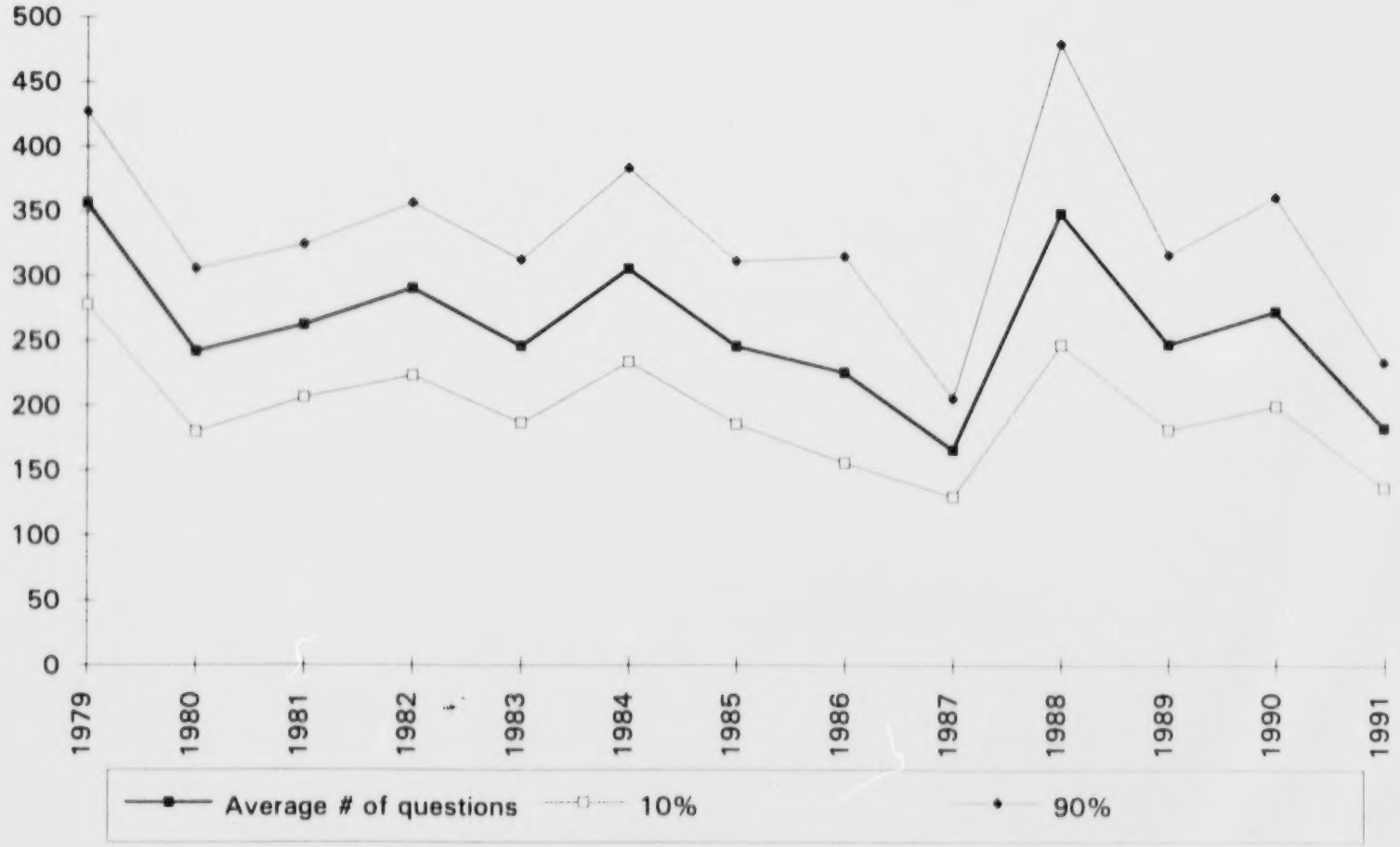


Figure 5 Average Number of NLSY Questions and Mean Length of Interview

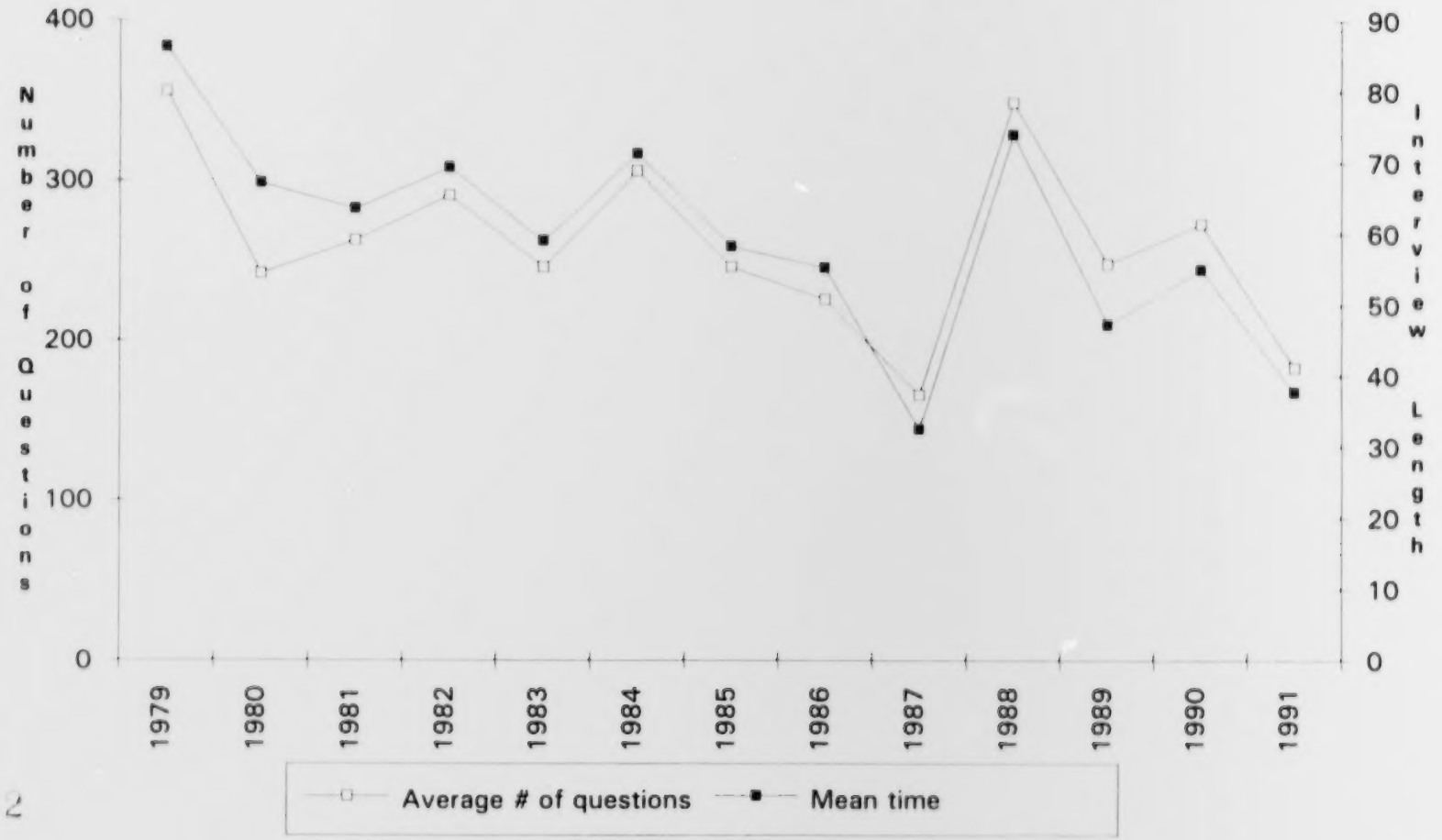


Figure 6

Predicted Hazard Rates for Men
Changing the Number of Questions

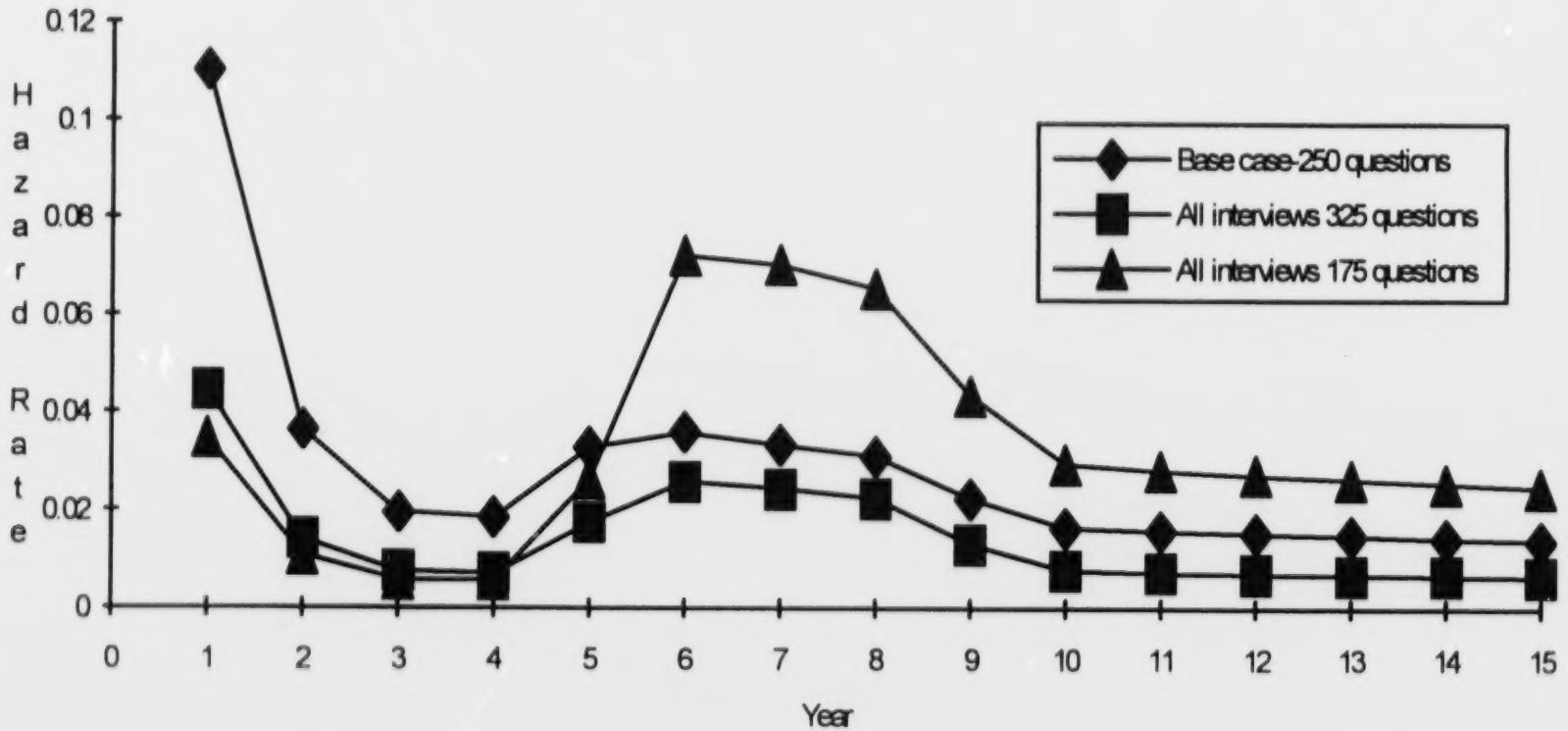
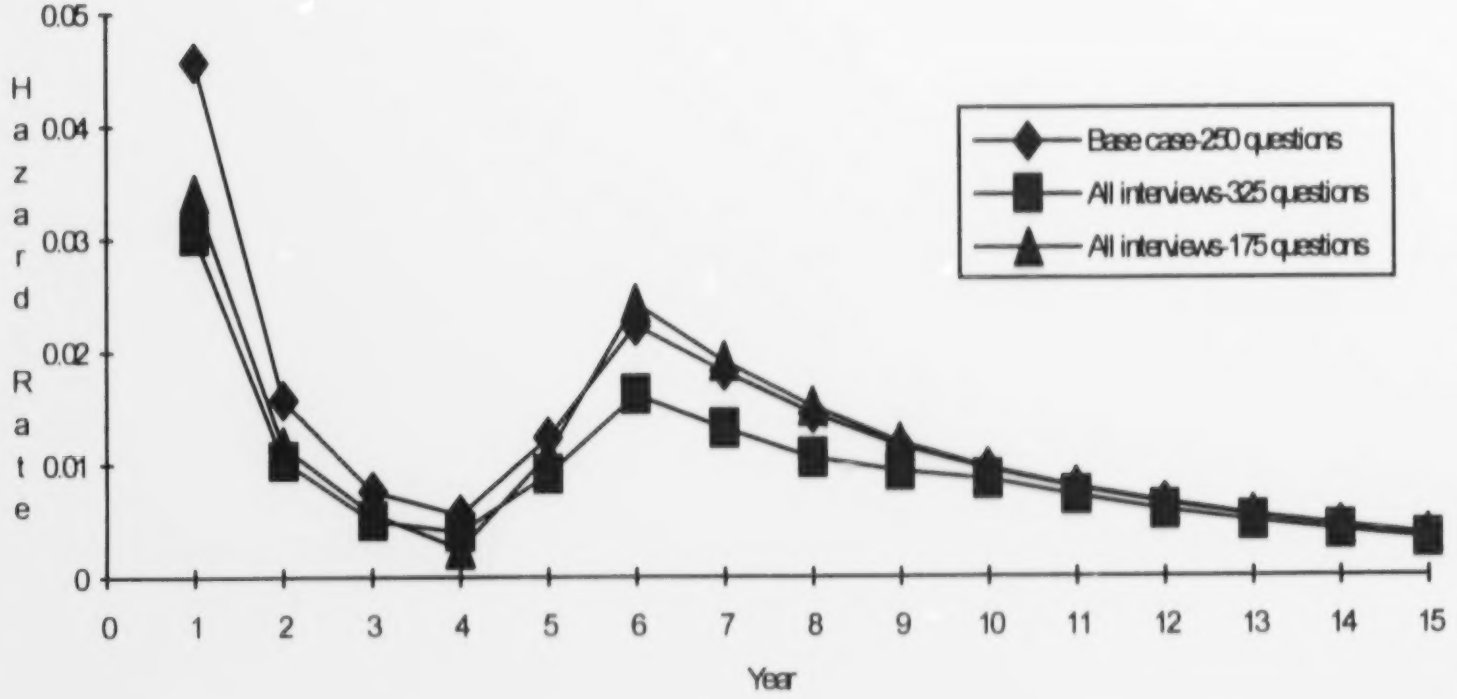


Figure 7

Predicted Hazard Rates for Women
Changing the Number of Questions



APPENDIX TABLES

Variable Definitions

VARIABLE	DEFINITION
BLACK	Black
HISPANC	Hispanic
Omitted category = Nonblack nonHispanic	
BYC1958	Year of birth 1958
BYC1959	Year of birth 1959
BYC1960	Year of birth 1960
BYC1961	Year of birth 1961
BYC1962	Year of birth 1962
BYC1963	Year of birth 1963
BYC1964	Year of birth 1964
Omitted category = Year of birth 1957	
NO RELIGION	No religion
CATHOLIC	Catholic
OTH RELIGION	Other religion
Omitted category = Protestant religion	
PARENTS HH	Parents living in household
Omitted category = Parents not living in household	
MARRIED	Married
PREV MARRIED	Previously married
Omitted category = Never married	
CHANGE MARRS	Change in marital status
Omitted category = No change in marital status	
NO KIDS N HH	No children in household
Omitted category = Children in household	
# OF KIDS HH	Number of own children in household
SCHOOL MISS	Current enrollment missing
IN SCHOOL	Currently enrolled in school
Omitted category = Currently not enrolled in school	
HGC MISSING	Highest grade completed missing
HS DROP-OUT	High school dropout
SOME COLLEGE	Some college
COLLEGE GRAD	College graduate
Omitted category = High school graduate	
EMPLOYED	Employed
Omitted category = Not employed	
EARN MISSING	Earnings missing
EARN REFUSED	Earnings refused
Omitted category = Earnings not refused	

EARN RF&DK	Earnings refused and don't know responses combined
	Omitted category = Earnings not refused and known
EARN ZER0	Earnings zero
EARN LOW 10%	Earnings in lowest 10th percentile
EARN 10%-25%	Earnings in 10th to 25th percentile
EARN 50%-75%	Earnings in 50th to 75th percentile
EARN UPR 75%	Earnings in 75th+ perrcentile
	Omitted category = Earnings in 25th to 50th percentile
# JOB MISSNG	Number of jobs missing
AVE#JOB/YEAR	Average number of jobs per year
WW MISSING	Number of weeks worked missing
WW/YEAR	Number of weeks worked per year
REGION MISS	Region of residence missing
NORTH-CENTRL	North-central region of residence
SOUTH	South region of residence
WEST	West region of residence
	Omitted category = Northeast region of residence
URBAN MISSNG	Urban residence missing
NOT SMSA	Residence not in an SMSA
SMSA NO CITY	Residence in SMSA not central city
SMSA DK CITY	Residence in SMSA, central city not known
SMSA CT CITY	Residence in SMSA, central city
	Omitted category = Residence rural
CONVERT MISS	Interview converted missing
CONVERTED	Interview converted
	Omitted category = Interview not converted
#CONT MISSNG	Number of attempted contacts
#CONT LW 10%	Number of attempted contacts lowest 10th percentile
#CONT 10-50%	Number of attempted contacts 75th to 90h percentile
#CONT 75-90%	Number of attempted contacts 75th to 90h percentile
#CONT UP 90%	Number of attempted contacts 90th + percentile
	Omitted category = Number of attempted contacts 50th to 75th percentile
INTTYPE MISS	Interview mode missing
TELEPHONE	Interview mode telephone
INPERSON OTH	Interview mode in person with others present
INPERSON DK	Interview mode in person, other present unknown
	Omitted category = Interview mode in person, no others present
DRUG QUESTNS	Drug questions asked in survey year
	Omitted category = Drug questions not asked in survey year
DRUG REFUSED	Drug questions refused
	Omitted category = Drug questions answered
ATT MISSING	Attitude toward interview missing
NO INTEREST	Not interested attidude during interiew
IMPATIENT	Impatient attitude during interview
HOSTILE	Hostile attitude during interview

Omitted category = Interested and cooperative attitude during interview

UNDER MISSNG Understanding of interview missing

FAIR UNDERST Understanding of interview fair

POOR UNDERST Understanding of interview poor

Omitted category = Understanding of interview good

#QS0-10% 0-5 Number of questions, 0 to 10th percentile, years 0 to 5

#QS10-25%0-5 Number of questions, 10th to 25th percentile, years 0 to 5

#QS50-75%0-5 Number of questions, 50th to 75th percentile, years 0 to 5

#QS75-90%0-5 Number of questions, 75th to 90th percentile, years 0 to 5

#QS90%+ 0-5 Number of questions, 90th+ percentile, years 0 to 5

Omitted category = Number of questions, 25th to 50th percentile, years 0 to 5

A#Q0-25% 0-5 Average number of questions, 0 to 25th percentile, years 0 to 5

A#Q50-75%0-5 Average number of questions, 50th to 75th percentile, years 0 to 5

A#Q75%+ 0-5 Average number of questions, 75th+ percentile, years 0 to 5

Omitted category = Average number of questions, 2th to 50th percentile, years 0 to 5

#QS0-10% 5-9 Number of questions, 0 to 10th percentile, years 5 to 9

#QS10-25%5-9 Number of questions, 10th to 25th percentile, years 5 to 9

#QS50-75%5-9 Number of questions, 50th to 75th percentile, years 5 to 9

#QS75-90%5-9 Number of questions, 75th to 90th percentile, years 5 to 9

#QS90%+ 5-9 Number of questions, 90th+ percentile, years 5 to 9

Omitted category = Number of questions, 50th to 75th percentile, years 5 to 9

A#Q0-25% 5-9 Average number of questions, 0 to 25th percentile, years 5 to 9

A#Q50-75%5-9 Average number of questions,50th to 75th percentile, years 5 to 9

A#Q75%+ 5-9 Average number of questions, 75th+ percentile, years 5 to 9

Omitted category = Average number of questions, 25th to 50th percentile, years 5 to 9

#QS0-10% 9+ Number of questions, 0 to 10th percentile, years 9+

#QS10-25% 9+ Number of questions, 10th to 25th percentile, years 9+

#QS50-75% 9+ Number of questions, 50th to 75th percentile, years 9+

#QS75-90% 9+ Number of questions, 75th to 90th percentile, years 9+

#QS90%+ 9+ Number of questions, 90th+ percentile, years 9+

Omitted category = Number of questions, 25th to 50th percentile, years 9+

A#Q0-25% 9+ Average number of questions, 0 to 25th percentile, years 9+

A#Q50-75% 9+ Average number of questions, 50th to 75th percentile, years 9+

A#Q75%+ 9+ Average number of questions, 75th+ percentile, years 9+

Omitted category = Average number of questions, 25th to 50th percentile, years 9+

INT < 30 0-5 Interview length less than 30 minutes, years 0-5

INT30-45 0-5 Interview length 30 to 45 minutes, years 0-5

INT60-75 0-5 Interview length 60 to 75 minutes, years 0-5

INT75-90 0-5 Interview length 75 to 90 minutes, years 0-5

INT 90+ 0-5 Interview length 90+minutes, years 0-5

Omitted category = Interview length 45 to 60 minutes, years 0-5

AVE < 45 0-5 Average interview length less than 45 minutes, years 0-5

AVE60-75 0-5 Average interview length 60 to 75 minutes, years 0-5

AVE75-90 0-5 Average interview length 75 to 90 minutes, years 0-5

AVE 90+ 0-5 Average interview length 90+ minutes, years 0-5

Omitted category = Average interview length 45 to 60 minutes, years 0-5

INT < 30 5-9	Interview length less than 30 minutes, years 5-9
INT30-45 5-9	Interview length 30 to 45 minutes, years 5-9
INT60-75 5-9	Interview length 60 to 75 minutes, years 5-9
INT75-90 5-9	Interview length 75 to 90 minutes, years 5-9
INT 90+ 5-9	Interview length 90+ minutes, years 5-9

Omitted category = Interview length 45 to 60 minutes, years 5-9

AVE < 45 5-9	Average interview length less than 45 minutes, years 5-9
AVE60-75 5-9	Average interview length 60 to 75 minutes, years 5-9
AVE75-90 5-9	Average interview length 75 to 90 minutes, years 5-9
AVE 90+ 5-9	Average interview length 90+ minutes, years 5-9

Omitted category = Average interview length 45 to 60 minutes, years 5-9

INT < 30 9+	Interview length less than 30 minutes, years 9+
INT30-45 9+	Interview length 30 to 45 minutes, years 9+
INT60-75 9+	Interview length 60 to 75 minutes, years 9+
INT75-90 9+	Interview length 75 to 90 minutes, years 9+
INT 90+ 9+	Interview length 90+ minutes, years 9+

Omitted category = Interview length 45 to 60 minutes, years 9+

AVE < 45 9+	Average interview length less than 45 minutes, years 9+
AVE60-75 9+	Average interview length 60 to 75 minutes, years 9+
AVE75-90 9+	Average interview length 75 to 90 minutes, years 9+
AVE 90+ 9+	Average interview length 90+ minutes, years 9+

Omitted category = Average interview length 45 to 60 minutes, years 9+

CONST YR 0-5	Constant term, years 0 to 5
LINEAR Y 0-5	Linear term, years 0 to 5
QUAD YR 0-5	Quadratic term, years 0 to 5
CONST YR 5-9	Constant term, years 5 to 9
LINEAR Y 5-9	Linear term, years 5 to 9
CONST YR 9+	Constant term, years 9+
LINEAR Y 9+	Linear term, years 9+

NONRESPONSE HAZARD ESTIMATION FOR MEN
INCLUDING INTERVIEW LENGTH

*** UNNORMALIZED LIKELIHOOD VALUE = -1.312 ***

VARIABLE	ESTIMATE	STD ERROR	T-STAT
BLACK =	-0.077496	0.089567	-0.8652
HISPANC =	0.191082	0.103696	1.8427
BYC1958 =	0.246143	0.153910	1.5993
BYC1959 =	0.043419	0.157634	0.2754
BYC1960 =	0.171718	0.150127	1.1438
BYC1961 =	0.037779	0.160253	0.2357
BYC1962 =	-0.073967	0.161871	-0.4570
BYC1963 =	-0.038166	0.168789	-0.2261
BYC1964 =	-0.189999	0.184316	-1.0308
NO RELIGION =	-0.091198	0.163264	-0.5586
CATHOLIC =	-0.014806	0.096963	-0.1527
OTH RELIGION=	0.191661	0.114102	1.6797
PARENTS HH =	-0.063741	0.092209	-0.6913
MARRIED =	0.196135	0.130709	1.5006
PREV MARRIED=	0.103339	0.173308	0.5963
CHANGE MARRS=	-0.324116	0.163624	-1.9809
NO KIDS N HH=	-0.014664	0.219321	-0.0669
# OF KIDS HH=	-0.327756	0.120486	-2.7203
SCHOOL MISS =	-2.877777	1.568567	-1.8347
IN SCHOOL =	-0.327058	0.115842	-2.8233
HGC MISSING =	0.897769	1.007761	0.8909
HS DROP-OUT =	0.231531	0.096126	2.4086
SOME COLLEGE=	-0.071104	0.110084	-0.6459
COLLEGE GRAD=	-0.127576	0.141362	-0.9025
EMPLOYED =	-0.184217	0.104272	-1.7667
EARN MISSING=	0.386762	0.288358	1.3413
EARN REFUSED=	0.415831	0.360121	1.1547
EARN RF&DK =	0.403836	0.236642	1.7065
EARN ZERO =	0.104812	0.166042	0.6312
EARN LOW 10%=	-0.180620	0.189043	-0.9554
EARN 10%-25%=	0.016161	0.143900	0.1123
EARN 50%-75%=	-0.017083	0.115074	-0.1485
EARN UPR 75%=	0.129845	0.117420	1.1058
# JOB MISSNG=	0.608920	0.393711	1.5466
AVE#JOB/YEAR=	0.198017	0.128441	1.5417
WW MISSING =	-0.766510	0.385035	-1.9908
WW/YEAR =	-0.009625	0.005138	-1.8732
REGION MISS =	0.776162	0.241581	3.2128
NORTH-CENTRL=	-0.327961	0.110717	-2.9622
SOUTH =	-0.178714	0.103301	-1.7300
WEST =	-0.140783	0.116411	-1.2094
URBAN MISSNG=	0.382252	0.160154	2.3868
NOT SMSA =	0.193749	0.165419	1.1713
SMSA NO CITY=	-0.080297	0.123879	-0.6482
SMSA DK CITY=	-0.025253	0.123101	-0.2051
SMSA CT CITY=	0.266432	0.131417	2.0274
CONVERT MISS=	-0.723306	0.664028	-1.0893
CONVERTED =	0.969343	0.106613	9.0922
#CONT MISSNG=	0.444304	0.406873	1.0920
#CONT LW 10%=	-0.432207	0.151773	-2.8477
#CONT 10-50%=	-0.379621	0.132710	-2.8605
#CONT 75-90%=	0.145174	0.128133	1.1330
#CONT UP 90%=	0.403410	0.110660	3.6455

INTTYPE MISS=	1.268994	0.406268	3.1235
TELEPHONE =	0.278995	0.103148	2.7048
INPERSON OTH=	0.092562	0.093635	0.9885
INPERSON DK =	-0.718348	0.506662	-1.4178
DRUG QUESTNS=	-0.103873	0.141143	-0.7359
DRUG REFUSED=	0.905098	0.652773	1.3865
ATT MISSING =	-0.055364	0.651820	-0.0849
NO INTEREST =	0.545785	0.083542	6.5330
IMPATIENT =	0.965485	0.138618	6.9651
HOSTILE =	1.824514	0.270918	6.7346
UNDER MISSNG=	0.443240	0.571290	0.7759
FAIR UNDERST=	-0.170451	0.111040	-1.5350
POOR UNDERST=	-0.291399	0.225147	-1.2943
INT < 30 0-5=	1.688132	0.492000	3.4312
INT30-45 0-5=	0.507797	0.312222	1.6264
INT60-75 0-5=	-0.089850	0.252242	-0.3562
INT75-90 0-5=	-0.709271	0.305532	-2.3214
INT 90+ 0-5=	-0.356757	0.319210	-1.1176
AVE < 45 0-5=	-0.155025	0.500246	-0.3099
AVE60-75 0-5=	0.620449	0.274702	2.2586
AVE75-90 0-5=	1.001331	0.301629	3.3197
AVE 90+ 0-5=	1.038160	0.339550	3.0575
INT < 30 5-9=	0.157708	0.244534	0.6449
INT30-45 5-9=	-0.112335	0.206348	-0.5444
INT60-75 5-9=	-0.273293	0.250203	-1.0923
INT75-90 5-9=	-0.183546	0.300635	-0.6105
INT 90+ 5-9=	-0.393419	0.305649	-1.2872
AVE < 45 5-9=	0.101097	0.405905	0.2491
AVE60-75 5-9=	-0.185764	0.180177	-1.0310
AVE75-90 5-9=	0.141965	0.224358	0.6328
AVE 90+ 5-9=	-0.033769	0.370039	-0.0913
INT < 30 9+=	-0.370725	0.248213	-1.4936
INT30-45 9+=	-0.318406	0.224297	-1.4196
INT60-75 9+=	-0.156451	0.306124	-0.5111
INT75-90 9+=	-0.826109	0.439112	-1.8813
INT 90+ 9+=	0.571769	0.367173	1.5572
AVE < 45 9+=	0.035767	0.364675	0.0981
AVE60-75 9+=	-0.273159	0.193017	-1.4152
AVE75-90 9+=	-0.913866	0.370216	-2.4685
AVE 90+ 9+=	-1.451234	1.257117	-1.1544
CONST YR 0-5=	-1.920920	0.542084	-3.5436
LINEAR Y 0-5=	-1.638588	0.347182	-4.7197
QUAD YR 0-5=	0.224050	0.066911	3.3485
CONST YR 5-9=	-2.673922	0.901933	-2.9647
LINEAR Y 5-9=	-0.077794	0.112361	-0.6924
CONST YR 9+ =	-2.613683	0.976040	-2.6778
LINEAR Y 9+ =	-0.090489	0.079051	-1.1447

NONRESPONSE HAZARD ESTIMATION FOR WOMEN
INCLUDING INTERVIEW LENGTH

*** UNNORMALIZED LIKELIHOOD VALUE = -1.009 ***

VARIABLE	ESTIMATE	STD ERROR	T-STAT
BLACK =	-0.081170	0.108138	-0.7506
HISPANC =	0.167190	0.114949	1.4545
BYC1958 =	-0.176414	0.160923	-1.0963
BYC1959 =	-0.041192	0.156373	-0.2634
BYC1960 =	-0.101024	0.156695	-0.6447
BYC1961 =	-0.376686	0.169045	-2.2283
BYC1962 =	-0.167863	0.171562	-0.9784
BYC1963 =	-0.301083	0.180866	-1.6647
BYC1964 =	-0.589481	0.203570	-2.8957
NO RELIGION =	0.043056	0.260950	0.1650
CATHOLIC =	0.254831	0.106003	2.4040
OTH RELIGION=	0.390007	0.121992	3.1970
PARENTS HH =	0.137278	0.108188	1.2689
MARRIED =	0.346822	0.118679	2.9224
PREV MARRIED=	0.163782	0.163798	0.9999
CHANGE MARRS=	0.042950	0.147992	0.2902
NO KIDS N HH=	0.321117	0.166710	1.9262
# OF KIDS HH=	-0.135504	0.086316	-1.5699
SCHOOL MISS =	-0.842462	0.981141	-0.8587
IN SCHOOL =	-0.412559	0.122681	-3.3629
HGC MISSING =	0.134548	0.732186	0.1838
HS DROP-OUT =	0.000341	0.126187	0.0027
SOME COLLEGE=	0.179194	0.108774	1.6474
COLLEGE GRAD=	-0.035317	0.152867	-0.2310
EMPLOYED =	-0.158633	0.113651	-1.3958
EARN MISSING=	0.042824	0.327477	0.1308
EARN REFUSED=	0.853964	0.403126	2.1184
EARN RF&DK =	-0.004761	0.309137	-0.0154
EARN ZERO =	-0.065514	0.160554	-0.4080
EARN LOW 10%=	-0.224559	0.187697	-1.1964
EARN 10%-25%=	-0.262226	0.163595	-1.6029
EARN 50%-75%=	0.041624	0.128922	0.3229
EARN UPR 75%=	-0.108969	0.151458	-0.7195
# JOB MISSNG=	0.082021	0.441154	0.1859
AVE#JOB/YEAR=	0.051555	0.173773	0.2967
WW MISSING =	-0.022765	0.429658	-0.0530
WW/YEAR =	-0.014060	0.006357	-2.2118
REGION MISS =	0.370791	0.324226	1.1436
NORTH-CENTRL=	-0.014223	0.124852	-0.1139
SOUTH =	0.020889	0.120475	0.1734
WEST =	0.025061	0.134294	0.1866
URBAN MISSNG=	0.439388	0.202129	2.1738
NOT SMSA =	-0.171017	0.198461	-0.8617
SMSA NO CITY=	0.083636	0.138608	0.6034
SMSA DK CITY=	0.122856	0.132595	0.9265
SMSA CT CITY=	0.389214	0.150162	2.5920
CONVERT MISS=	0.252905	0.541768	0.4668
CONVERTED =	1.151551	0.116898	9.8509
#CONT MISSNG=	1.361259	0.489803	2.7792
#CONT LW 10%=	0.013335	0.149135	0.0894
#CONT 10-50%=	-0.423341	0.140592	-3.0111

#CONT 75-90%=	0.432472	0.139656	3.0967
#CONT UP 90%=	0.588902	0.132956	4.4293
INTTYPE MISS=	-0.436877	0.594457	-0.7349
TELEPHONE =	0.457614	0.113890	4.0180
INPERSON OTH=	-0.004424	0.112706	-0.0393
INPERSON DK =	-0.194455	0.627752	-0.3098
DRUG QUESTNS=	-0.387524	0.166242	-2.3311
DRUG REFUSED=	1.774349	0.759752	2.3354
ATT MISSING =	1.385296	0.602948	2.2975
NO INTEREST =	0.806960	0.097715	8.2583
IMPATIENT =	1.471330	0.159871	9.2033
HOSTILE =	2.159783	0.326793	6.6090
UNDER MISSNG=	-0.623546	0.622963	-1.0009
FAIR UNDERST=	-0.071922	0.138775	-0.5183
POOR UNDERST=	-0.337417	0.302317	-1.1161
INT < 30 0-5=	1.016673	0.723884	1.4045
INT30-45 0-5=	0.340658	0.315148	1.0809
INT60-75 0-5=	-0.106269	0.279996	-0.3795
INT75-90 0-5=	-0.175528	0.315866	-0.5557
INT 90+ 0-5=	-0.180841	0.363667	-0.4973
AVE < 45 0-5=	-0.557055	0.492237	-1.1317
AVE60-75 0-5=	-0.186825	0.268358	-0.6962
AVE75-90 0-5=	-0.049741	0.306143	-0.1625
AVE 90+ 0-5=	0.087145	0.360801	0.2415
INT < 30 5-9=	0.012381	0.329432	0.0376
INT30-45 5-9=	-0.370906	0.234246	-1.5834
INT60-75 5-9=	-0.310783	0.260700	-1.1921
INT75-90 5-9=	-0.088382	0.314750	-0.2808
INT 90+ 5-9=	0.110826	0.299126	0.3705
AVE < 45 5-9=	0.197092	0.544549	0.3619
AVE60-75 5-9=	-0.296175	0.201071	-1.4730
AVE75-90 5-9=	-0.612493	0.264868	-2.3124
AVE 90+ 5-9=	-0.616510	0.388870	-1.5854
INT < 30 9+=	0.075131	0.304810	0.2465
INT30-45 9+=	0.307141	0.277372	1.1073
INT60-75 9+=	0.469927	0.356514	1.3181
INT75-90 9+=	-0.052782	0.457638	-0.1153
INT 90+ 9+=	0.241401	0.469038	0.5147
AVE < 45 9+=	-0.140402	0.512768	-0.2738
AVE60-75 9+=	-0.415211	0.220349	-1.8843
AVE75-90 9+=	-0.322459	0.357666	-0.9016
AVE 90+ 9+=	-1.940734	1.032285	-1.8800
CONST YR 0-5=	-2.197406	0.538230	-4.0827
LINEAR Y 0-5=	-1.277366	0.385818	-3.3108
QUAD YR 0-5=	0.145752	0.075653	1.9266
CONST YR 5-9=	-2.829703	1.029557	-2.7485
LINEAR Y 5-9=	-0.124715	0.130559	-0.9552
CONST YR 9+ =	-4.572331	1.111149	-4.1150
LINEAR Y 9+ =	-0.013125	0.089026	-0.1474

NONRESPONSE HAZARD ESTIMATION FOR MEN
INCLUDING NUMBER OF QUESTIONS ASKED

*** UNNORMALIZED LIKELIHOOD VALUE = -1.312 ****

VARIABLE	ESTIMATE	STD ERROR	T-STAT
BLACK =	-0.058698	0.088581	-0.6627
HISPANC =	0.212819	0.103687	2.0525
BYC1958 =	0.242999	0.153114	1.5870
BYC1959 =	0.026191	0.156914	0.1669
BYC1960 =	0.158673	0.149607	1.0606
BYC1961 =	0.011609	0.159458	0.0728
BYC1962 =	-0.129105	0.160299	-0.8054
BYC1963 =	-0.140159	0.169670	-0.8261
BYC1964 =	-0.320811	0.193267	-1.6599
NO RELIGION =	-0.102833	0.164188	-0.6263
CATHOLIC =	0.001471	0.096543	0.0152
OTH RELIGION=	0.183365	0.112784	1.6258
PARENTS HH =	-0.054481	0.094049	-0.5793
MARRIED =	0.214661	0.131198	1.6362
PREV MARRIED=	0.140348	0.176937	0.7932
CHANGE MARRS=	-0.348410	0.164149	-2.1225
NO KIDS N HH=	-0.005680	0.220073	-0.0258
# OF KIDS HH=	-0.293343	0.122211	-2.4003
SCHOOL MISS =	-2.868990	1.542927	-1.8594
IN SCHOOL =	-0.363239	0.116083	-3.1291
HGC MISSING =	0.888029	0.959172	0.9258
HS DROP-OUT =	0.206023	0.097272	2.1180
SOME COLLEGE=	-0.018528	0.110525	-0.1676
COLLEGE GRAD=	-0.054738	0.140939	-0.3884
EMPLOYED =	-0.194951	0.104839	-1.8595
EARN MISSING=	0.332224	0.292294	1.1366
EARN REFUSED=	0.442298	0.353775	1.2502
EARN RF&DK =	0.370560	0.235996	1.5702
EARN ZERO =	0.082586	0.167493	0.4931
EARN LOW 10%=	-0.249247	0.196056	-1.2713
EARN 10%-25%=	-0.003578	0.144400	-0.0248
EARN 50%-75%=	-0.008838	0.116593	-0.0758
EARN UPR 75%=	0.123079	0.118108	1.0421
# JOB MISSNG=	0.687057	0.396285	1.7337
AVE#JOB/YEAR=	0.450438	0.152804	2.9478
WW MISSING =	-0.826649	0.392065	-2.1085
WW/YEAR =	-0.008084	0.005325	-1.5181
REGION MISS =	0.746641	0.244049	3.0594
NORTH-CENTRL=	-0.326736	0.110015	-2.9699
SOUTH =	-0.195457	0.103237	-1.8933
WEST =	-0.132679	0.116679	-1.1371
URBAN MISSNG=	0.391774	0.160416	2.4422
NOT SMSA =	0.172430	0.164713	1.0468
SMSA NO CITY=	-0.067619	0.123877	-0.5459
SMSA DK CITY=	-0.014800	0.123271	-0.1201
SMSA CT CITY=	0.265053	0.130773	2.0268
CONVERT MISS=	-0.719704	0.655055	-1.0987
CONVERTED =	0.981346	0.106987	9.1725
#CONT MISSNG=	0.413444	0.409074	1.0107
#CONT LW 10%=	-0.421339	0.151292	-2.7849
#CONT 10-50%=	-0.390358	0.132082	-2.9554
#CONT 75-90%=	0.144119	0.127129	1.1336

#CONT UP 90%=	0.397473	0.110484	3.5976
INTTYPE MISS=	1.248761	0.408478	3.0571
TELEPHONE =	0.301240	0.102083	2.9509
INPERSON OTH=	0.086022	0.094211	0.9131
INPERSON DK =	-0.691776	0.507725	-1.3625
DRUG QUESTNS=	-0.124969	0.146422	-0.8535
DRUG REFUSED=	0.815245	0.658093	1.2388
ATT MISSING =	-0.024293	0.648699	-0.0374
NO INTEREST =	0.556994	0.083176	6.6966
IMPATIENT =	0.951501	0.138014	6.8942
HOSTILE =	1.883210	0.265742	7.0866
UNDER MISSNG=	0.390991	0.571213	0.6845
FAIR UNDERST=	-0.181048	0.111662	-1.6214
POOR UNDERST=	-0.283598	0.225890	-1.2555
#QS0-10% 0-5=	0.509778	0.543627	0.9377
#QS10-25%0-5=	-0.514796	0.315402	-1.6322
#QS50-75%0-5=	-0.494119	0.224505	-2.2009
#QS75-90%0-5=	-0.444986	0.271262	-1.6404
#QS90%+ 0-5=	-0.554747	0.315168	-1.7602
A#Q0-25% 0-5=	0.000000	0.000000	0.0000
A#Q50-75%0-5=	-0.551279	0.280362	-1.9663
A#Q75%+ 0-5=	-0.514200	0.348377	-1.4760
#QS0-10% 5-9=	-0.274475	0.263849	-1.0403
#QS10-25%5-9=	0.313751	0.208192	1.5070
#QS50-75%5-9=	0.014268	0.205140	0.0696
#QS75-90%5-9=	-0.024370	0.290439	-0.0839
#QS90%+ 5-9=	-0.694203	0.471936	-1.4710
A#Q0-25% 5-9=	0.722525	0.669435	1.0793
A#Q50-75%5-9=	-0.375836	0.188676	-1.9920
A#Q75%+ 5-9=	-0.367821	0.332880	-1.1050
#QS0-10% 9+=	0.122116	0.247805	0.4928
#QS10-25% 9+=	-0.064095	0.268554	-0.2387
#QS50-75% 9+=	0.238010	0.237355	1.0028
#QS75-90% 9+=	0.116448	0.320692	0.3631
#QS90%+ 9+=	0.773202	0.369324	2.0936
A#Q0-25% 9+=	-0.079522	0.566033	-0.1405
A#Q50-75% 9+=	-0.282501	0.194066	-1.4557
A#Q75%+ 9+=	-2.588438	0.852636	-3.0358
CONST YR 0-5=	-0.330232	0.680815	-0.4851
LINEAR Y 0-5=	-1.776788	0.390291	-4.5525
QUAD YR 0-5=	0.237950	0.070959	3.3533
CONST YR 5-9=	-2.483179	0.973865	-2.5498
LINEAR Y 5-9=	-0.116380	0.125409	-0.9280
CONST YR 9+ =	-3.036336	1.001558	-3.0316
LINEAR Y 9+ =	-0.094541	0.080268	-1.1778

NONRESPONSE HAZARD ESTIMATION FOR WOMEN
INCLUDING NUMBER OF QUESTIONS ASKED

*** UNNORMALIZED LIKELIHOOD VALUE = -1.0102 ****

VARIABLE	ESTIMATE	STD ERROR	T-STAT
BLACK =	-0.076744	0.108484	-0.7074
HISPANC =	0.143018	0.113730	1.2575
BYC1958 =	-0.169945	0.160879	-1.0563
BYC1959 =	-0.035848	0.155687	-0.2303
BYC1960 =	-0.079156	0.155833	-0.5080
BYC1961 =	-0.362308	0.168080	-2.1556
BYC1962 =	-0.161322	0.172789	-0.9336
BYC1963 =	-0.316653	0.182633	-1.7338
BYC1964 =	-0.624970	0.207810	-3.0074
NO RELIGION =	0.043460	0.260397	0.1669
CATHOLIC =	0.263816	0.106928	2.4672
OTH RELIGION=	0.378084	0.121961	3.1000
PARENTS HH =	0.184049	0.109342	1.6832
MARRIED =	0.327920	0.118327	2.7713
PREV MARRIED=	0.161811	0.162980	0.9928
CHANGE MARRS=	0.065984	0.147180	0.4483
NO KIDS N HH=	0.282176	0.168671	1.6729
# OF KIDS HH=	-0.091020	0.091107	-0.9991
SCHOOL MISS =	-0.911896	0.972822	-0.9374
IN SCHOOL =	-0.423059	0.123408	-3.4281
HGC MISSING =	0.205615	0.733386	0.2804
HS DROP-OUT =	-0.061537	0.126449	-0.4867
SOME COLLEGE=	0.218813	0.108827	2.0106
COLLEGE GRAD=	0.014518	0.153701	0.0945
EMPLOYED =	-0.133664	0.115117	-1.1611
EARN MISSING=	0.005528	0.326904	0.0169
EARN REFUSED=	0.819077	0.399920	2.0481
EARN RF&DK =	-0.032131	0.307376	-0.1045
EARN ZERO =	-0.137240	0.160626	-0.8544
EARN LOW 10%=	-0.256745	0.190447	-1.3481
EARN 10%-25%=	-0.274453	0.167186	-1.6416
EARN 50%-75%=	0.029250	0.131933	0.2217
EARN UPR 75%=	-0.129842	0.153011	-0.8486
# JOB MISSNG=	0.205589	0.441133	0.4660
AVE#JOB/YEAR=	0.224636	0.192763	1.1653
WW MISSING =	-0.293839	0.436146	-0.6737
WW/YEAR =	-0.013626	0.006467	-2.1070
REGION MISS =	0.318369	0.323230	0.9850
NORTH-CENTRL=	0.016331	0.123285	0.1325
SOUTH =	0.011022	0.119449	0.0923
WEST =	0.048843	0.133635	0.3655
URBAN MISSNG=	0.442190	0.201684	2.1925
NOT SMSA =	-0.133503	0.199171	-0.6703
SMSA NO CITY=	0.097747	0.138868	0.7039
SMSA DK CITY=	0.133473	0.132369	1.0083
SMSA CT CITY=	0.395317	0.150759	2.6222
CONVERT MISS=	0.271625	0.545018	0.4984
CONVERTED =	1.124093	0.116976	9.6096
#CONT MISSNG=	1.366500	0.475723	2.8725
#CONT LW 10%=	-0.004749	0.149198	-0.0318
#CONT 10-50%=	-0.436804	0.141295	-3.0914
#CONT 75-90%=	0.432871	0.139126	3.1114
#CONT UP 90%=	0.592219	0.133587	4.4332

INTTYPE MISS=	-0.422395	0.590698	-0.7151
TELEPHONE =	0.439248	0.112239	3.9135
INPERSON OTH=	-0.005229	0.113489	-0.0461
INPERSON DK =	-0.189397	0.635455	-0.2980
DRUG QUESTNS=	-0.458403	0.177884	-2.5770
DRUG REFUSED=	1.792682	0.757000	2.3681
ATT MISSING =	1.426478	0.588147	2.4254
NO INTEREST =	0.829081	0.096227	8.6159
IMPATIENT =	1.482991	0.159666	9.2881
HOSTILE =	2.186373	0.325140	6.7244
UNDER MISSNG=	-0.681028	0.616237	-1.1051
FAIR UNDERST=	-0.085982	0.138314	-0.6216
POOR UNDERST=	-0.345483	0.301904	-1.1443
#QS0-10% 0-5=	0.862489	0.637638	1.3526
#QS10-25%0-5=	0.538829	0.322323	1.6717
#QS50-75%0-5=	-0.022179	0.251900	-0.0880
#QS75-90%0-5=	-0.067719	0.318660	-0.2125
#QS90%+ 0-5=	-0.418155	0.352077	-1.1877
A#Q0-25% 0-5=	-1.000280	0.867057	-1.1536
A#Q50-75%0-5=	-0.325024	0.302025	-1.0762
A#Q75%+ 0-5=	-0.377334	0.392358	-0.9617
#QS0-10% 5-9=	-0.209005	0.353705	-0.5909
#QS10-25%5-9=	0.136803	0.256878	0.5326
#QS50-75%5-9=	-0.053401	0.233271	-0.2289
#QS75-90%5-9=	0.062677	0.282725	0.2217
#QS90%+ 5-9=	-0.000678	0.379291	-0.0018
A#Q0-25% 5-9=	0.647498	1.269340	0.5101
A#Q50-75%5-9=	-0.427955	0.226662	-1.8881
A#Q75%+ 5-9=	-0.730976	0.321501	-2.2736
#QS0-10% 9+=	0.200709	0.295460	0.6793
#QS10-25% 9+=	0.227605	0.285361	0.7976
#QS50-75% 9+=	-0.094329	0.314032	-0.3004
#QS75-90% 9+=	-0.420314	0.382756	-1.0981
#QS90%+ 9+=	0.136805	0.361365	0.3786
A#Q0-25% 9+=	-0.714090	1.096532	-0.6512
A#Q50-75% 9+=	-0.254067	0.228801	-1.1104
A#Q75%+ 9+=	-0.354803	0.406367	-0.8731
CONST YR 0-5=	-1.420228	0.716872	-1.9811
LINEAR Y 0-5=	-1.626739	0.426060	-3.8181
QUAD YR 0-5=	0.183662	0.079703	2.3043
CONST YR 5-9=	-2.454935	1.066977	-2.3008
LINEAR Y 5-9=	-0.203823	0.138001	-1.4770
CONST YR 9+ =	-3.995844	1.099902	-3.6329
LINEAR Y 9+ =	-0.064573	0.090783	-0.7113

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